Severe Turbulence Over Northeast Caused by Strong Shear
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It was evident that January 16, 2014 was going to be busy. Ellrod Index computed from NAM model guidance (see Figure 1) was indicating a possible area of severe turbulence, but it was unclear just how severe the turbulence was going to be. Ellrod Index is calculated based on the product of horizontal deformation and vertical wind shear. See this link for further explanation.

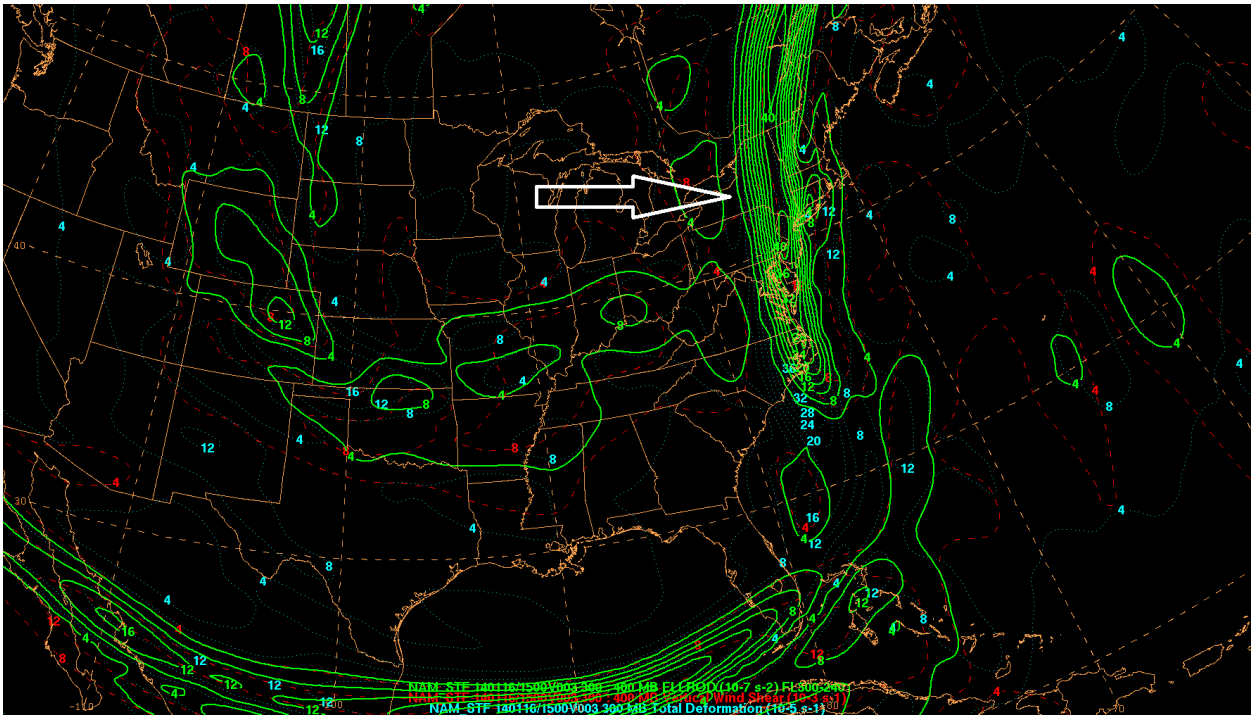

Figure 1. Ellrod Index at 400 mb (approximately FL220) valid 1500 UTC January 16, 2014 from 1200 UTC NAM run. Courtesy NOAA Aviation Weather Center.

The weather scenario on that day is certainly an area of interest for severe turbulence given the tight gradient in the wind fields at the 250 mb level (approximately FL330) in the anticyclonic portion of the jet stream (see Figure 2). The model guidance was showing an area of strong wind shear from eastern North Carolina to eastern Pennsylvania to northeastern New York. While the trough over the central part of the country began digging southward and the east-west oriented jet max began moving south the shortwave trough (see Figure 3) became more negatively tilted thereby causing the upper level jet to become more anticyclonic. This helped increase the wind gradient. The evolution of the system is found on this image loop.

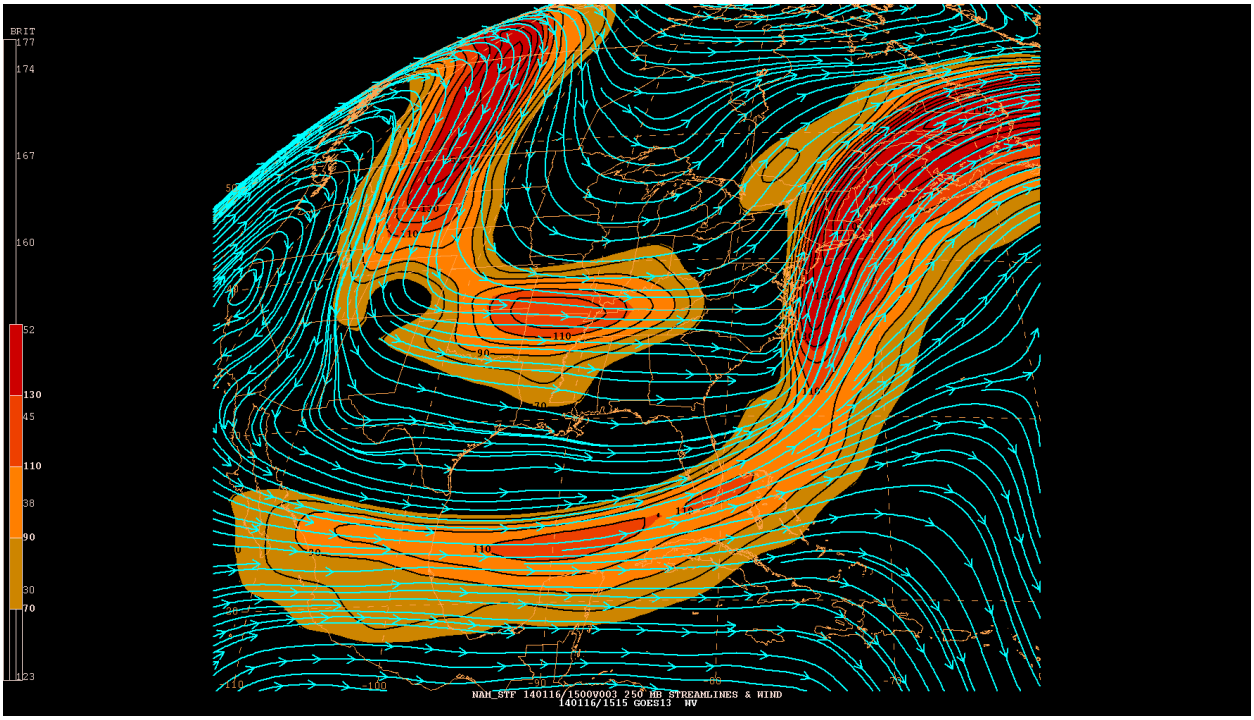

Figure 2: NAM streamlines and isotachs at 250 mb (approximately FL330) valid 1500 UTC January 16, 2014 from 1200 UTC NAM run. Courtesy NOAA Aviation Weather Center.

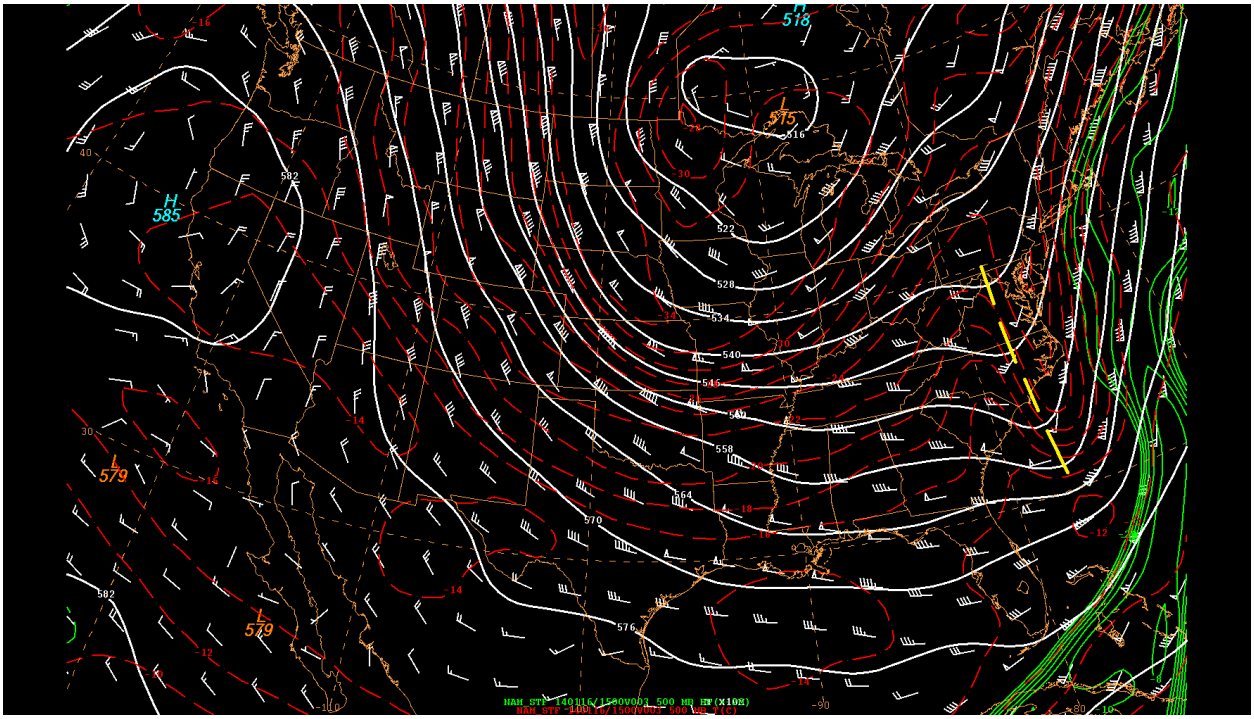

Figure 3: NAM heights, winds, and temperature at 500 mb (approximately FL180) valid 1500 UTC January 16, 2014 from the 1200 UTC NAM run. Courtesy NOAA Aviation Weather Center.

The first Pilot Report (PIREP) of moderate to severe turbulence was reported at 1300 UTC at FL250 from a Boeing 737.

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DOV/UUA/OV ENO135010/TM 1300/FL250/TP B737/TB MOD-SEV
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The FA East desk received a few more moderate-to-severe and severe reports shortly afterward and SIGMET (SIGnificant METeorological information) Victor series was issued.

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WSUS01 KKCI 161414
WS1V
BOSV WS 161414
SIGMET VICTOR 1 VALID UNTIL 161814
ME NH VT MA RI CT NY NJ PA MD DE VA AND CSTL WTRS
FROM 20E PLB TO 20ESE ENE TO 20SSW PVD TO 150E ORF TO 30SW
ORF TO 20NE HNK TO 20E PLB
OCNL SEV TURB BTN 130 AND FL330. DUE TO WNDSHR ASSOCD WITH
JTST.
RPTD BY ACFT. CONDS CONTG BYD 1814Z.
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The Aviation Weather Center received 15 severe, 10 moderate to severe, and 2 extreme turbulence reports ranging from FL230-FL360 with the majority of the reports in the middle 20 kft to lower 30 kft range.

Unfortunately five flight attendants received minor injuries when their flight encountered severe turbulence. The flight originated out of Newark Airport heading to Beijing when it encountered the severe turbulence at FL330 over Vermont. The flight then returned to Newark airport to seek medical attention for those injured.